Accelerator & NuMI Upgrades Update

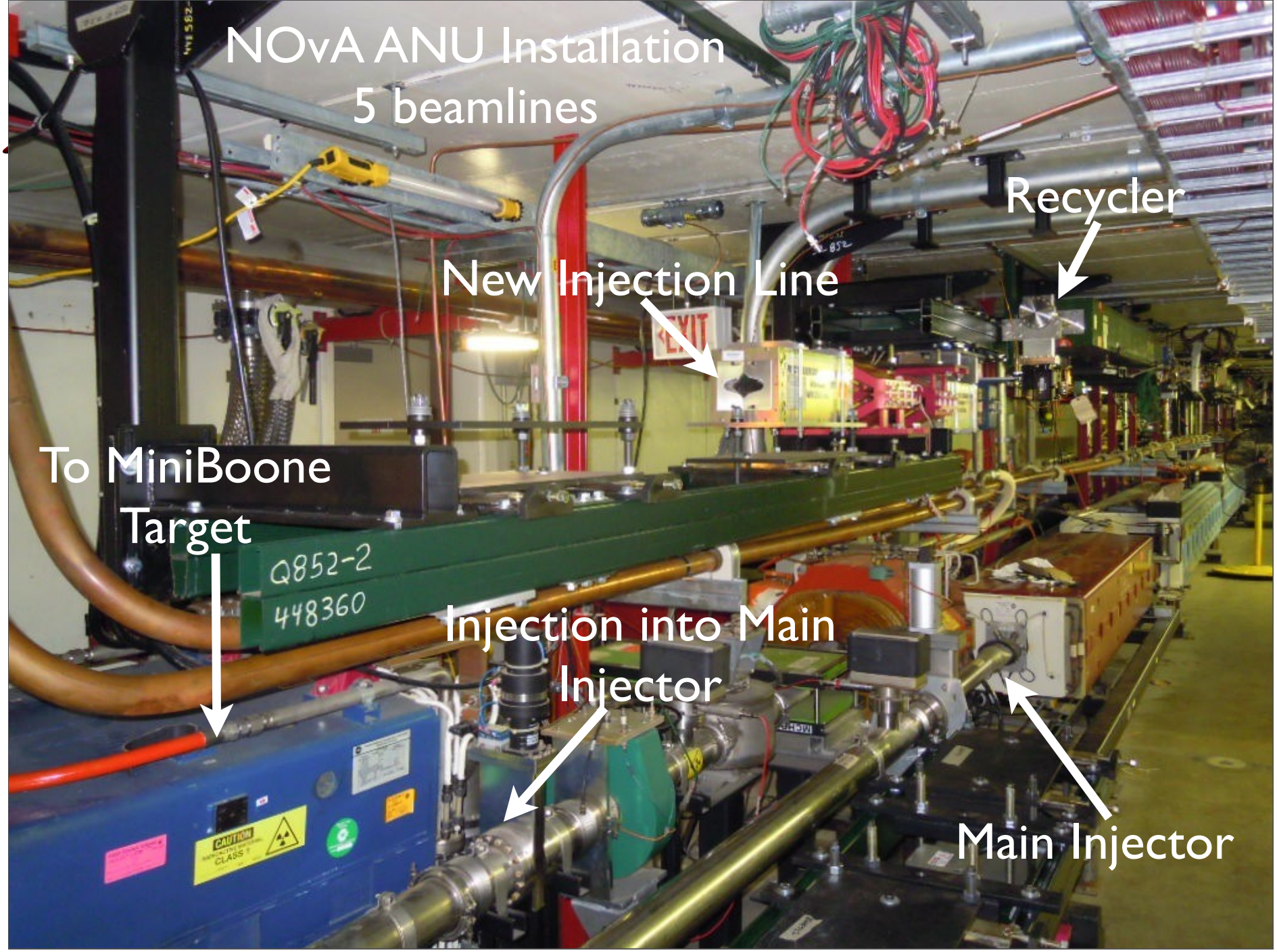
Paul Derwent

26 July 2012

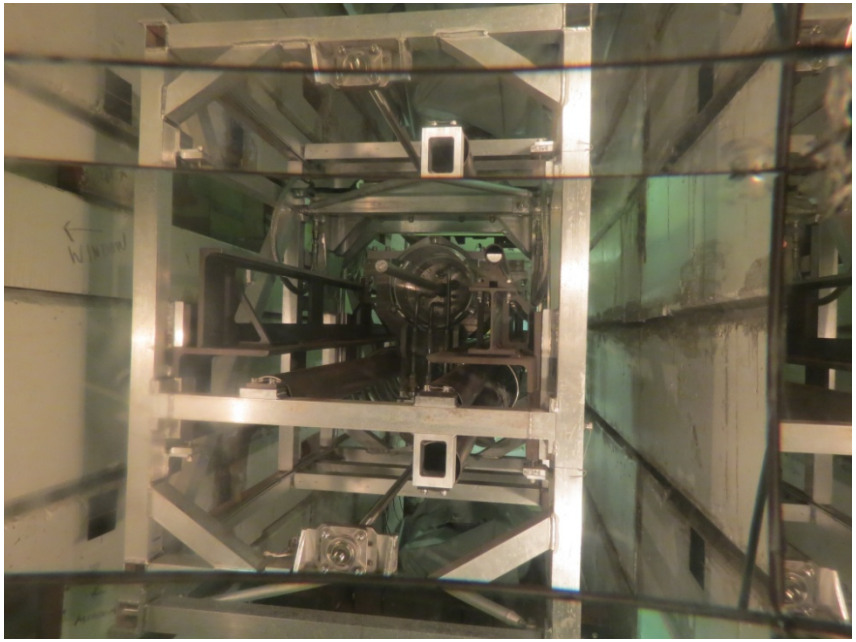
Shutdown Schedule & Progress

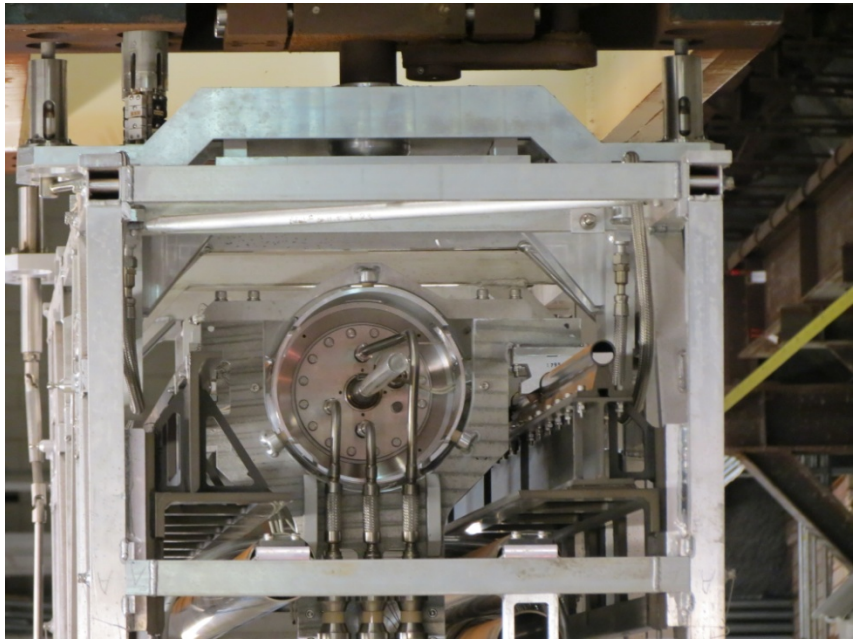
- Injection Line installation progressing: ~ 2 weeks behind
  - Remaining work
    - Injection Kickers & Lambertson
    - Recycler section
    - Beam pipe installation (will hold off declaring all the work complete)
- RR30 decommissioning complete by end of July: 6 weeks ahead of schedule
  - Removed electron cooling section
  - Removed lattice insert
- Target Hall work going well:
  - Utilities work for LCW and RAW systems, dehumidification
  - NuMI target and Horn 1 removed and stored in the morgue
  - Configuration changes for relocation of Horn 2 well underway

- **The laboratory is providing the necessary resources to complete the work on schedule**
  - Constraining resource is welder availability
  - Also working around summer vacations with associated slowdowns

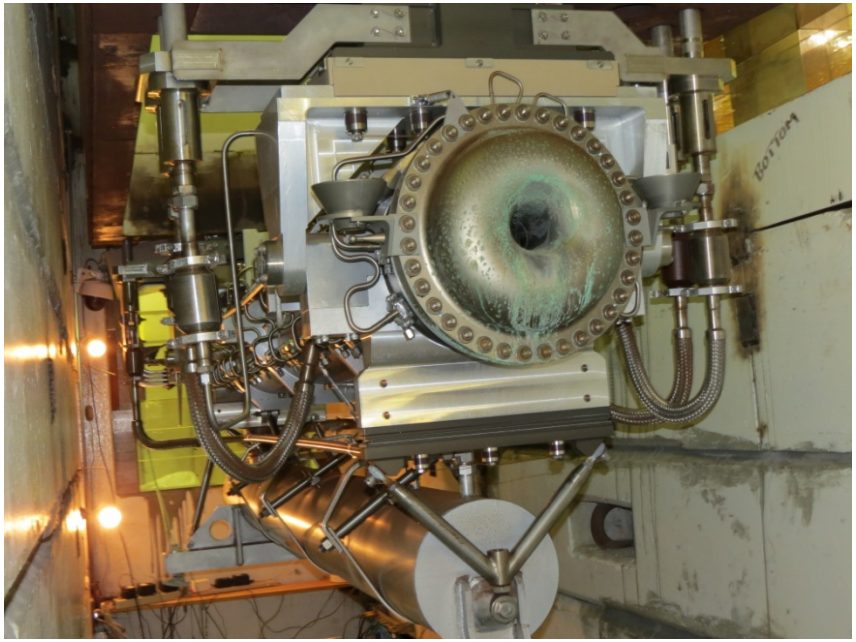

NOvA ANU Installation
5 beamlines
Recycler
New Injection Line
To MiniBoone
Target
Q852-2
448360
Injection into Main
Injector
Main Injector

Target NT-07 coming out





NuMI Horn 1 coming out



Recycler Permanent Quads

- Need 43 permanent quads for new injection line, extraction line, and R30 straight section
  - Original plan was to remove 38 from existing lines and Recycler
  - Send to Tech Division and retune to desired strength
- Spring of 2010: resources available to build new magnets
  - Originally there was a plan to refurbish most of the 20" permanent magnet quads removed from the tunnel during the NOvA shutdown. This was found to be a risk to the schedule. Any problems in the refurbishment would have a large impact on the schedule. Building all the magnets ahead of the shutdown will be safer schedule-wise and might well accelerate the shutdown a bit. The five spare quads in storage will still be used.
  - CR 168, $108k cost
- Summer of 2012:
  - R30 ‘hot’ so waited 8 weeks to get started
  - Some of the magnets Radioactive Class 3 (>10 mR/hr at 1 foot)
    - TD does not have facilities to work with Class 3 materials

Critical Path items

- Lambertson magnets: 1 delivered, 1 completed magnet measurements
  - Installation scheduled in August (Injection line) and December (Extraction line)
- Remaining kickers are in fabrication
  - 3 of 4 RKD complete (with beam tubes!) and in power testing, installation scheduled in September
  - RKB magnets to follow (all parts in hand), installation scheduled in December
- Beam pipe (316L stainless, seamless 4" OD)
  - Had a difficult time finding it in quantity
  - US vendors but Chinese mills
  - Complete injection line installation (impacts progress reports as tasks defined with PMT type E 50-50: 50% when start, 50% when complete)
- RF cavities:
  - 1st cavity has outer loops, awaiting final water manifolds, testing in August
  - 2nd cavity had major vacuum welds in June, need to complete vacuum ports, then start on cooling hoops
  - 3rd cavity scheduled to e-beam welder 1st week in August

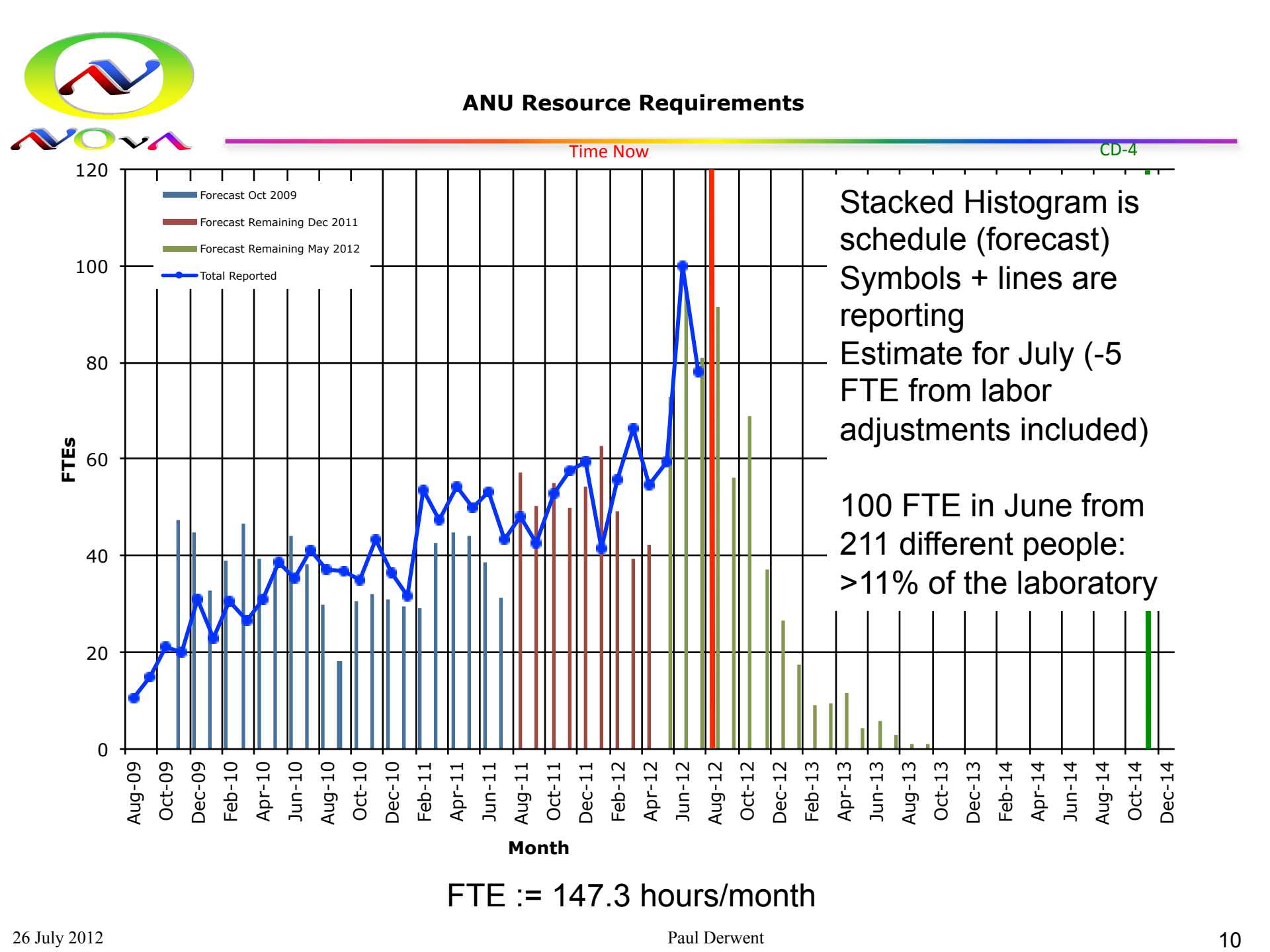
ANU Costs

- ANU continues to have a negative cost variance
  - In many places we underestimated the necessary labor to complete the tasks
  - Covered by the estimated assigned labor contingency
  - RF cavities are an exception where major technical problems and EVMS rules contributed to a significant cost variance
  - Changes in staffing over the past year have affected our ability to get work done efficiently

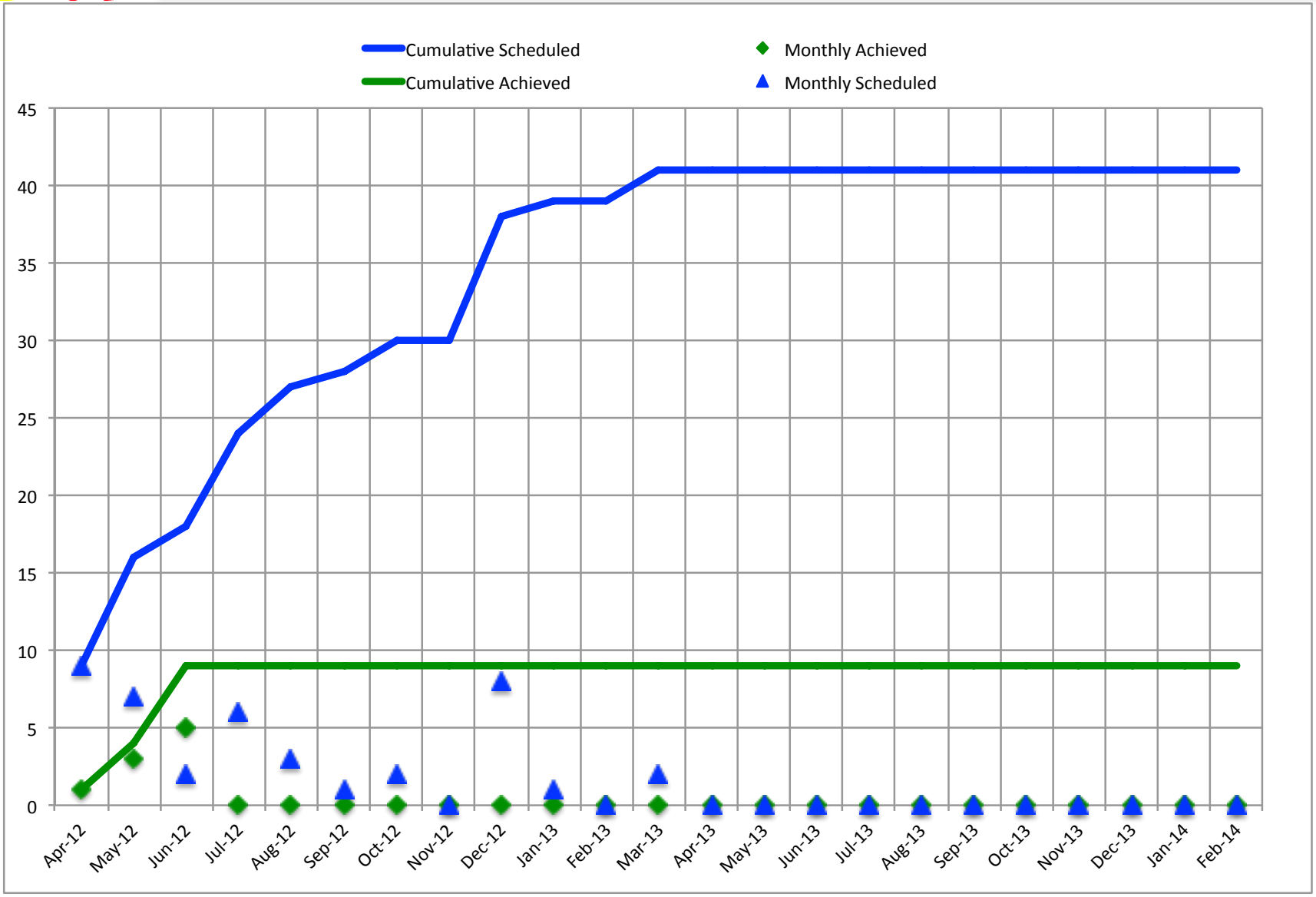
- Project managers are actively looking at all charges, especially labor
  - Have found some instances to correct (on instrumentation and magnet tasks)
    - In process in July / August time periods
  - Have found some disconnects between budgeted rates and actual rates in T&M
    - Negative CV of -$75k in June, -$51k in May

Summary

- Shutdown proceeding well:
  - Some places ahead
  - Some places behind
- Laboratory providing necessary resources to stay on schedule
- Critical path items still kickers and RF cavities
- Ahead of schedule to be complete 1 April 2013


ANU Resource Requirements
Time Now
CD-4
Forecast Oct 2009
Forecast Remaining Dec 2011
Forecast Remaining May 2012
Total Reported
FTEs
Month
Stacked Histogram is schedule (forecast)
Symbols + lines are reporting
Estimate for July (-5 FTE from labor adjustments included)
100 FTE in June from 211 different people: >11% of the laboratory
FTE := 147.3 hours/month

Remaining milestones



NOVA Project

Milestone Gantt Chart

Progress Reporting - thru June 2012

Time Now: 01Jul12
Baseline: LastMonth

Baseline Milestone ▼
Completed Milestone ☆
Milestone △

Activity ID	Milestone Description	Computed Status	Early/Actual Date	Baseline Date	Milestone Level	FY12 Q1	FY12 Q2	FY12 Q3	FY12 Q4	FY13 Q1	FY13 Q2	FY13 Q3	FY13 Q4	FY14 Q1	FY14 Q2	FY14 Q3	FY14 Q4	FY15 Q1
1.0 -- ANU Planning, Engineering & Design						Now - 01Jul12												
1.0.2.1.6.3	MI Machine Timing Complete	Planned	05Oct12	12Sep12	L.5					-17d								

Project: NOVA_PROJECT
View: NOVA_BARVW_31
Filter: Milestone = [BOOL.T] and ESDATE >= {5/1/07} and Nova_ANU = [BOOL.T] and COMPSTAT <> [ACTS.2]
Sort: BaselineFinish
Run: 25Jul12

NOVA Project

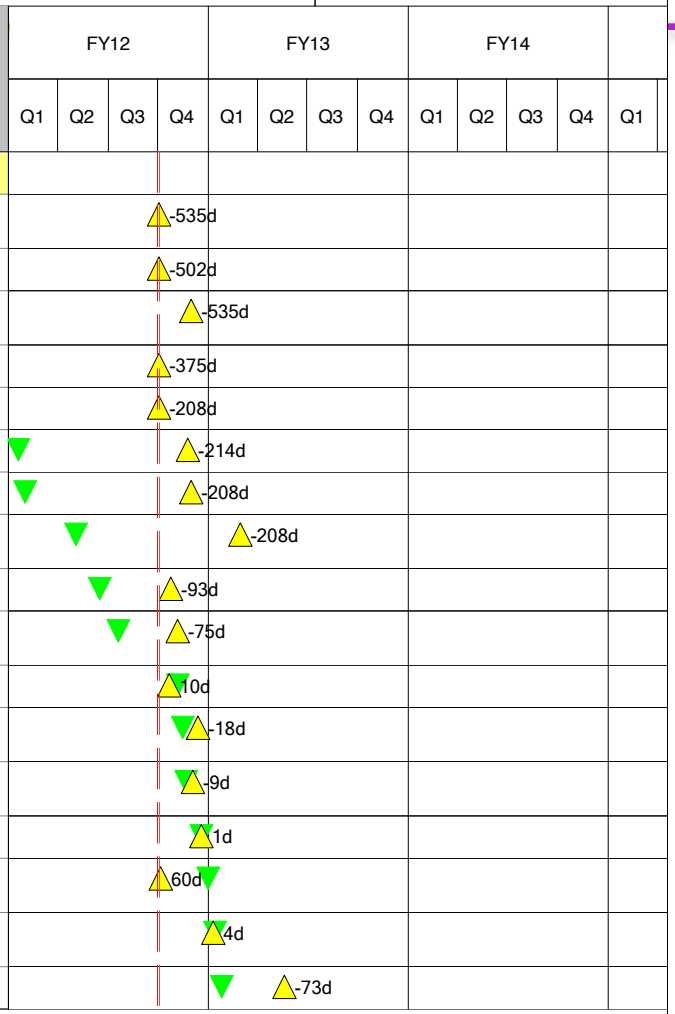
Milestone Gantt Chart

Progress Reporting - thru June 2012

Time Now: 01Jul12
Baseline: LastMonth

Baseline Milestone
Completed Milestone
Milestone

Activity ID	Milestone Description	Computed Status	Early/Actual Date	Baseline Date	Milestone Level
2.0 -- ANU Construction					
2.0.4.4.2.13	Off-Project:: NuMI Modified Horn 1 Ready for Installation	Planned	02Jul12	14May10	L.5
2.0.3.2.4.7	NuMI IHEP ME Target Accord Signed	Planned	02Jul12	01Jul10	L.5
2.0.4.4.2.8	Off-Project: NuMI Horn 1 Modules Installed in Chase Complete	Planned	29Aug12	15Jul10	L.5
2.0.1.3.4.3	RR DCCT Ready for Installation	Planned	02Jul12	05Jan11	L.5
2.0.1.1.5.10	First MLAW Magnet Complete	Planned	02Jul12	01Sep11	L.5
2.0.1.3.4.5	RR BPM System Procurement Complete	Planned	24Aug12	18Oct11	L.5
2.0.1.1.5.11	Second MLAW Magnet Complete	Planned	29Aug12	31Oct11	L.5
2.0.1.1.5.12	All MLAW Magnets Complete (including spares)	Planned	26Nov12	01Feb12	L.5
2.0.4.4.3.7	RR Inj & GC Install PFNs in MI-14 & MI-39	Planned	24Jul12	13Mar12	L.5
2.0.4.4.3.10	RR Inj & GC Install Resonant Chargers in MI-14 & MI-39	Planned	03Aug12	18Apr12	L.5
2.0.2.2.5.5	MI LCW System Mods Complete	Planned	20Jul12	03Aug12	L.5
2.0.1.3.4.6	RR BPM Transition Boards Ready for Installation	Planned	10Sep12	14Aug12	L.5
2.0.3.2.4.3	NuMI ME Target/Carrier/Baffle Assembly Complete	Planned	31Aug12	20Aug12	L.3
2.0.3.2.4.8	Replacement Hadron Monitor Delivered	Planned	17Sep12	17Sep12	L.5
2.0.2.2.5.4	MI RF Cavities (2) Installation & Testing Complete	Planned	03Jul12	28Sep12	L.3
2.0.1.2.8.3	RR Beam Abort Kicker Checkout/Test Complete	Planned	08Oct12	12Oct12	L.5
2.0.1.1.5.5	RR LCW System Mods Complete	Planned	14Feb13	25Oct12	L.5



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Run: 25Jul12

NOVA Project

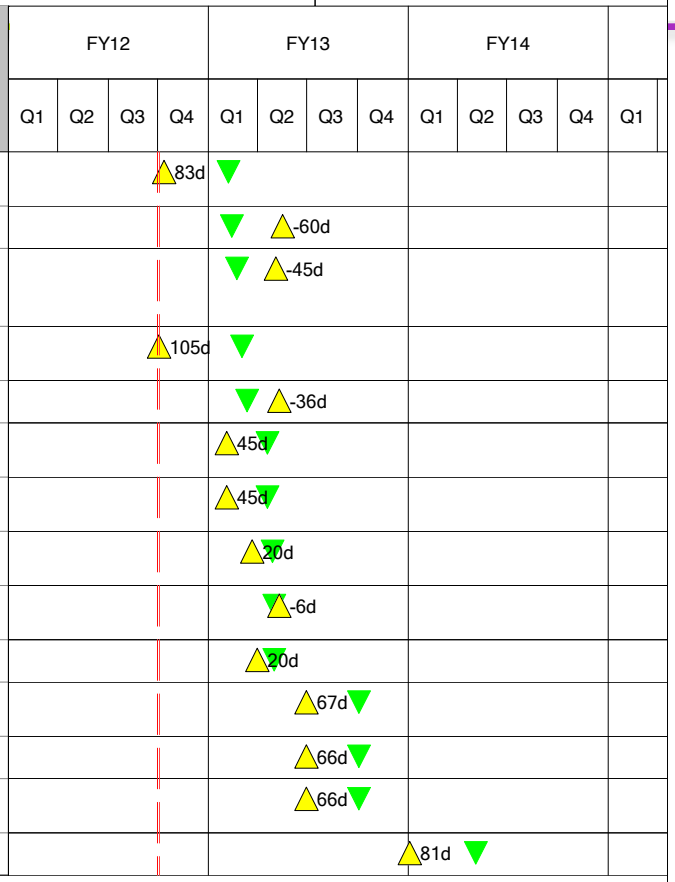
Milestone Gantt Chart

Progress Reporting - thru June 2012

Time Now: 01Jul12
Baseline: LastMonth

Baseline Milestone ▼
Completed Milestone ☆
Milestone △

Activity ID	Milestone Description	Computed Status	Early/Actual Date	Baseline Date	Milestone Level
2.0.3.3.4.2	NuMI Installation of Target Chase Cooling Complete	Planned	11Jul12	06Nov12	L.5
2.0.1.1.5.1	RR 53 Mhz RF Ready for Beam	Planned	13Feb13	12Nov12	L.4
2.0.1.2.8.4	RR Injection & Gap Clearing Magnets & Fluorinert Piping in Tunnel Checkout/Test Complete	Planned	30Jan13	19Nov12	L.5
2.0.4.3.13	ANU Shielding Assessment Updates Complete	Planned	02Jul12	30Nov12	L.3
2.0.1.2.8.5	RR All Kicker Systems Ready for Beam	Planned	05Feb13	10Dec12	L.3
2.0.3.1.5.1	NuMI Charging PS Upgrades Testing Complete	Planned	02Nov12	14Jan13	L.5
2.0.3.1.5.2	NuMI Primary Beamline Ready for Faster Cycle Time	Planned	02Nov12	14Jan13	L.4
2.0.3.4.4.3	NuMI Cooling Water (Non-RAW) Mods Complete	Planned	19Dec12	23Jan13	L.5
2.0.1.2.8.2	RR Extraction MI Injection Line Kicker Checkout/Test Complete	Planned	05Feb13	28Jan13	L.5
2.0.3.4.4.2	NuMI RAW Systems Mods Complete	Planned	26Dec12	28Jan13	L.5
2.0.4.3.15	MI Ring Modifications Ready for Beam Transport	Planned	26Mar13	01Jul13	L.2
2.0.4.3.16	RR Modifications Ready for Beam Transport	Planned	27Mar13	01Jul13	L.2
2.0.4.3.17	Ready to Commission Upgrades with Medium Energy Neutrino Beam	Planned	27Mar13	01Jul13	L.2
2.0.4.3.21	ANU Subproject Complete	Planned	01Oct13	31Jan14	L.5



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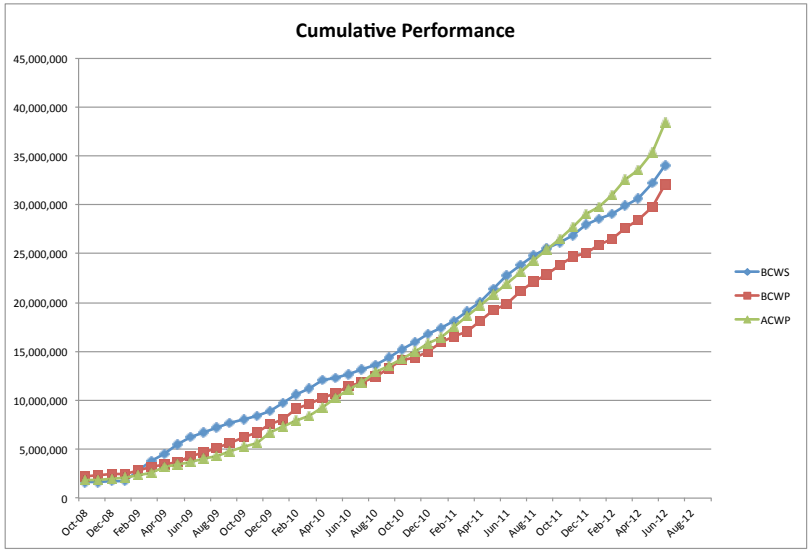
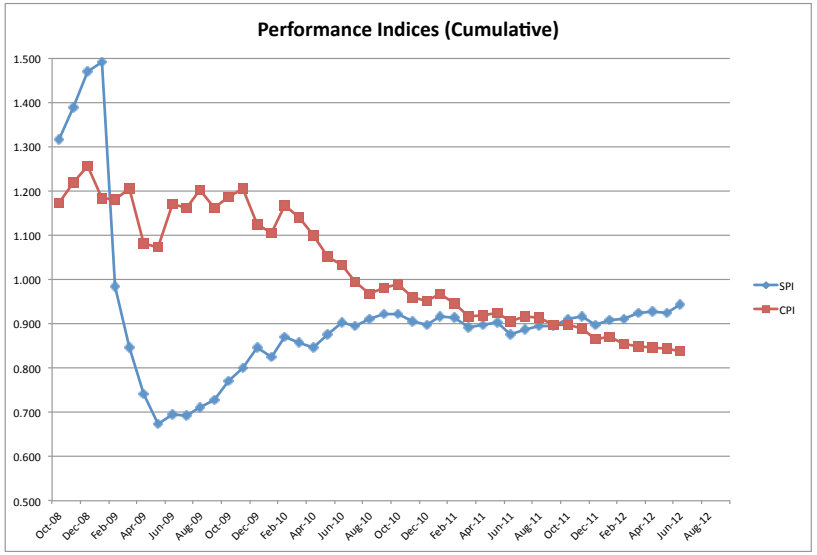
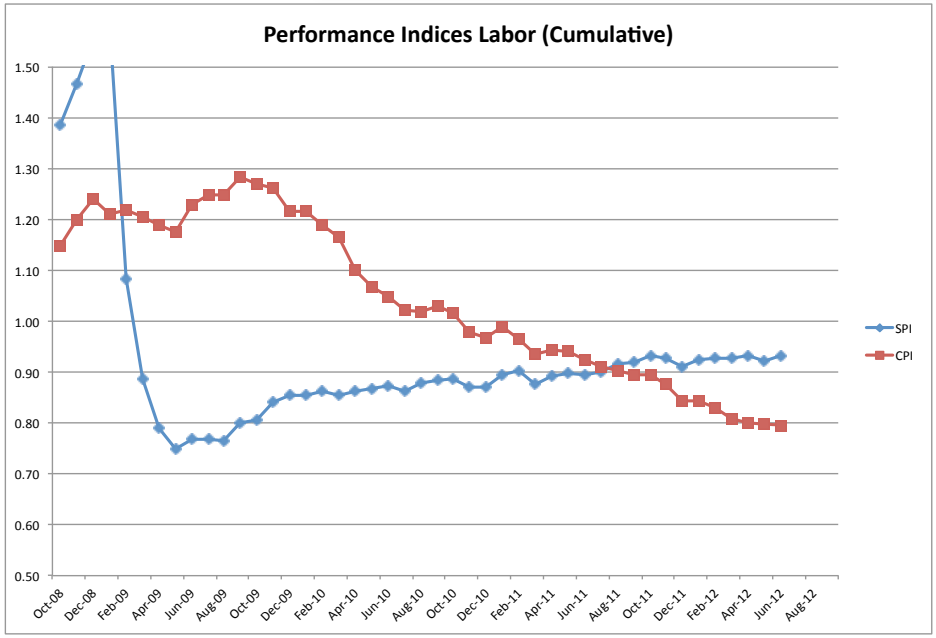
EVMS Performance

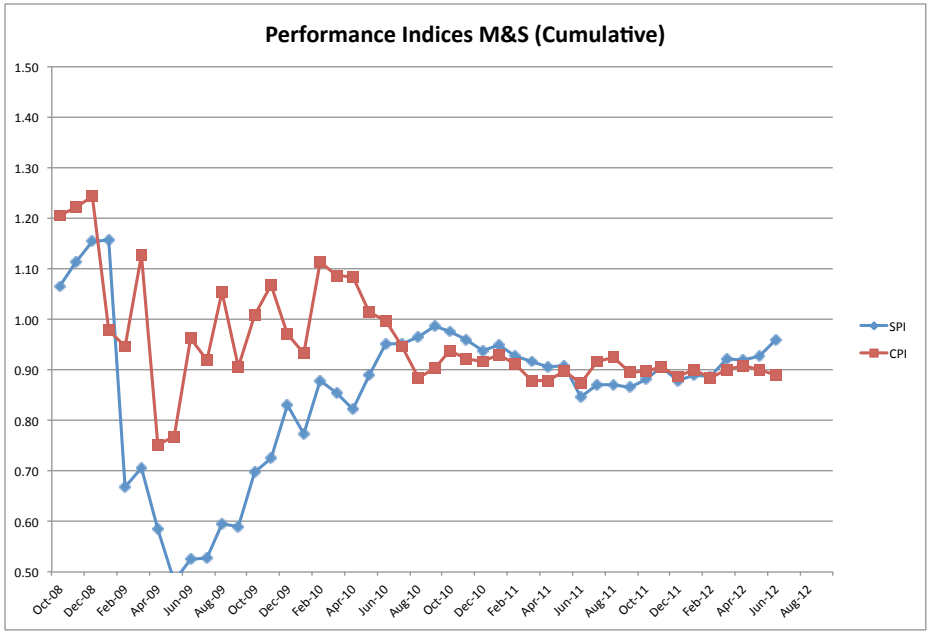




Month	BCWS	BCWP	ACWP	SPI	CPI
Oct-11	$452,944	$616,798	$716,328	1.36	0.86
Nov-11	$732,319	$834,344	$1,178,574	1.14	0.71
Dec-11	$1,017,305	$369,795	$1,274,208	0.36	0.29
Jan 12	$581,113	$860,305	$805,092	1.48	1.069
Feb-12	$561,330	$544,809	$1,180,131	0.97	0.46
Mar-12	$759,409	$1,128,324	$1,541,540	1.49	0.73
Apr-12	$845,830	$820,307	$1,041,863	0.97	0.79
May-12	$1,561,287	$1,372,793	$1,757,983	0.88	0.78
Jun-12	$1,785,348	$2,327,656	$3,027,918	1.30	0.77

More breakdown





- CPI for labor stabilized at 0.80, for M&S stabilized at 0.9
  - In March, took all tasks that started in April – July and moved $ from labor contingency to labor budget
  - Decommissioning tasks went positive in both schedule and cost
  - Still catching up with RF (negative again)
  - Overhead rate change did affect CPI for month: Suzanne made a correction based on BCWS in Oct-May time period. Work with BCWS before Oct did not get correction, so hit all in June (e.g., RF). ~1.5%
  - T&M rates in Cobra do not match T&M rates charged, -$75k CV in June on BCWP

From the September 2008 PMG

ANU Costs/Budget

- Need to do a variance analysis from work done before January 1, 2008 - over ran on labor
  - More time spent on preparing /doing reviews in FY07 & FY08 then anticipated
  - Under-estimating labor seems to occur no matter how hard I try

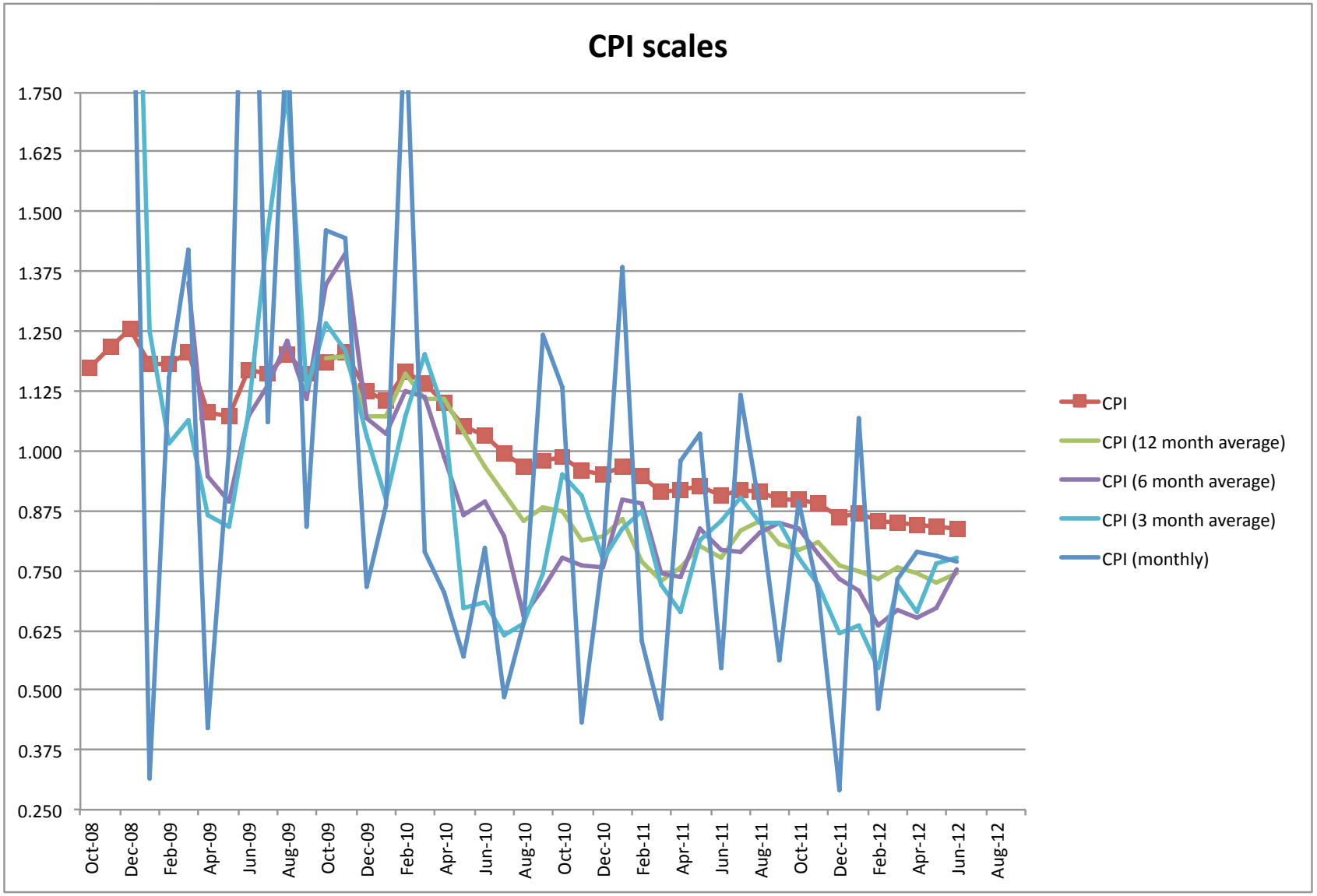
CONTRACT PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE

1. CONTRACTOR	2. CONTRACT	3. PROGRAM	4. REPORT PERIOD
a. NAME Fermi National Accelerator Laboratory	a. NAME	a. NAME NOvA project	a.FROM 01-Mar-2008 b.TO 31-Mar-2008

8. PERFORMANCE DATA

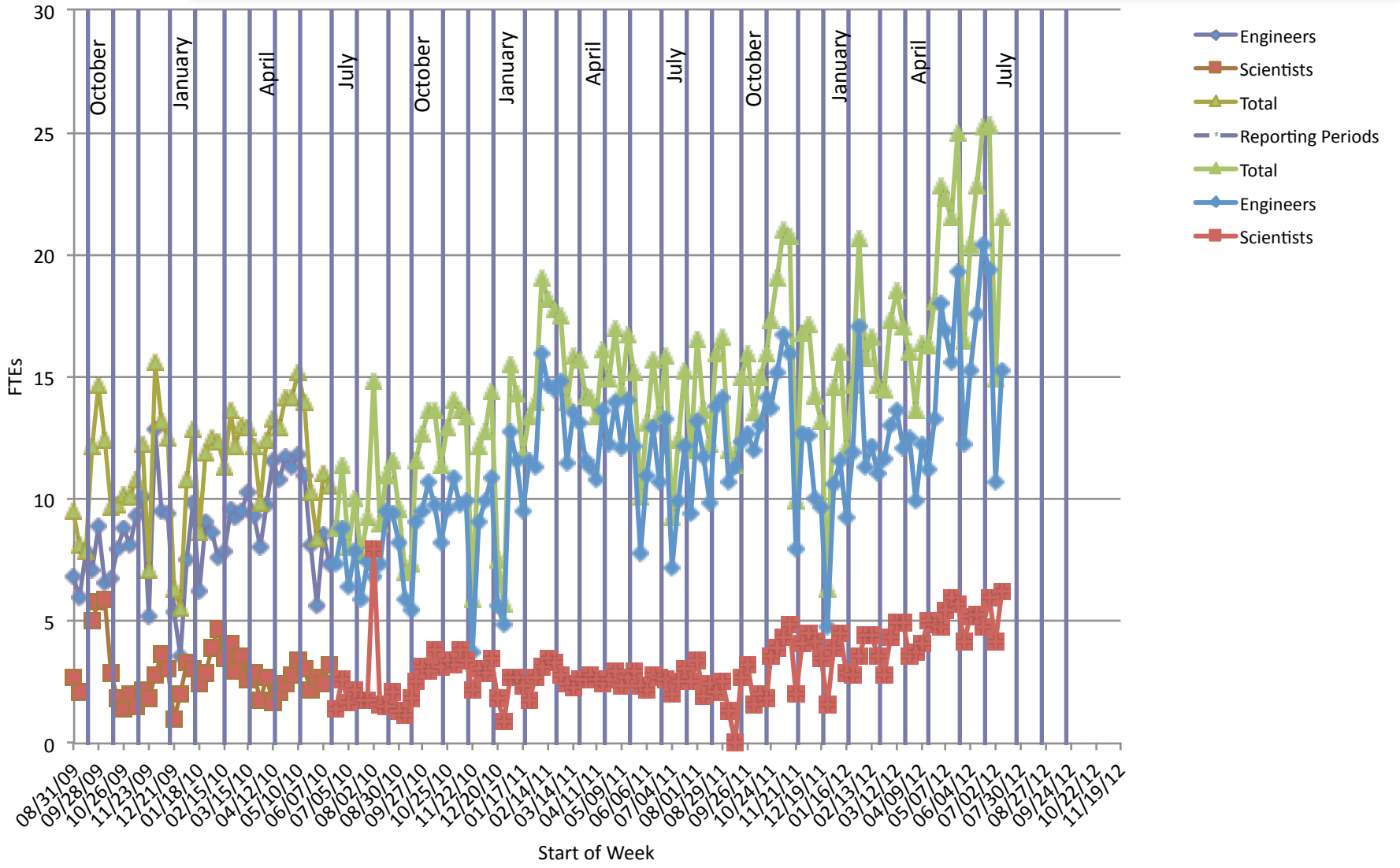
ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE		
	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	BUDGETED
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(14)
DA DOE-ACEL MIE											
2.0 ANU Construction Fully burdened AY$K	0	0	0	0	0	207	207	132	0	75	30,084
DD DOE-ACEL R&D											
1.0 ANU Planning, Engineering & Design Fully burdened AY$K	6	0	0	(6)	0	1,348	1,353	1,570	5	(217)	7,401
CostAcctFndSrcTotals:	6	0	0	(6)	0	1,348	1,353	1,570	5	(217)	7,401
DO DOE-ACEL OPS											
1.0 ANU Planning, Engineering & Design Fully burdened AY$K	0	0	0	0	0	80	80	7	0	73	1,206
CostAcctFndSrcTotals:	0	0	0	0	0	80	80	7	0	73	1,206

Shorter term trending?

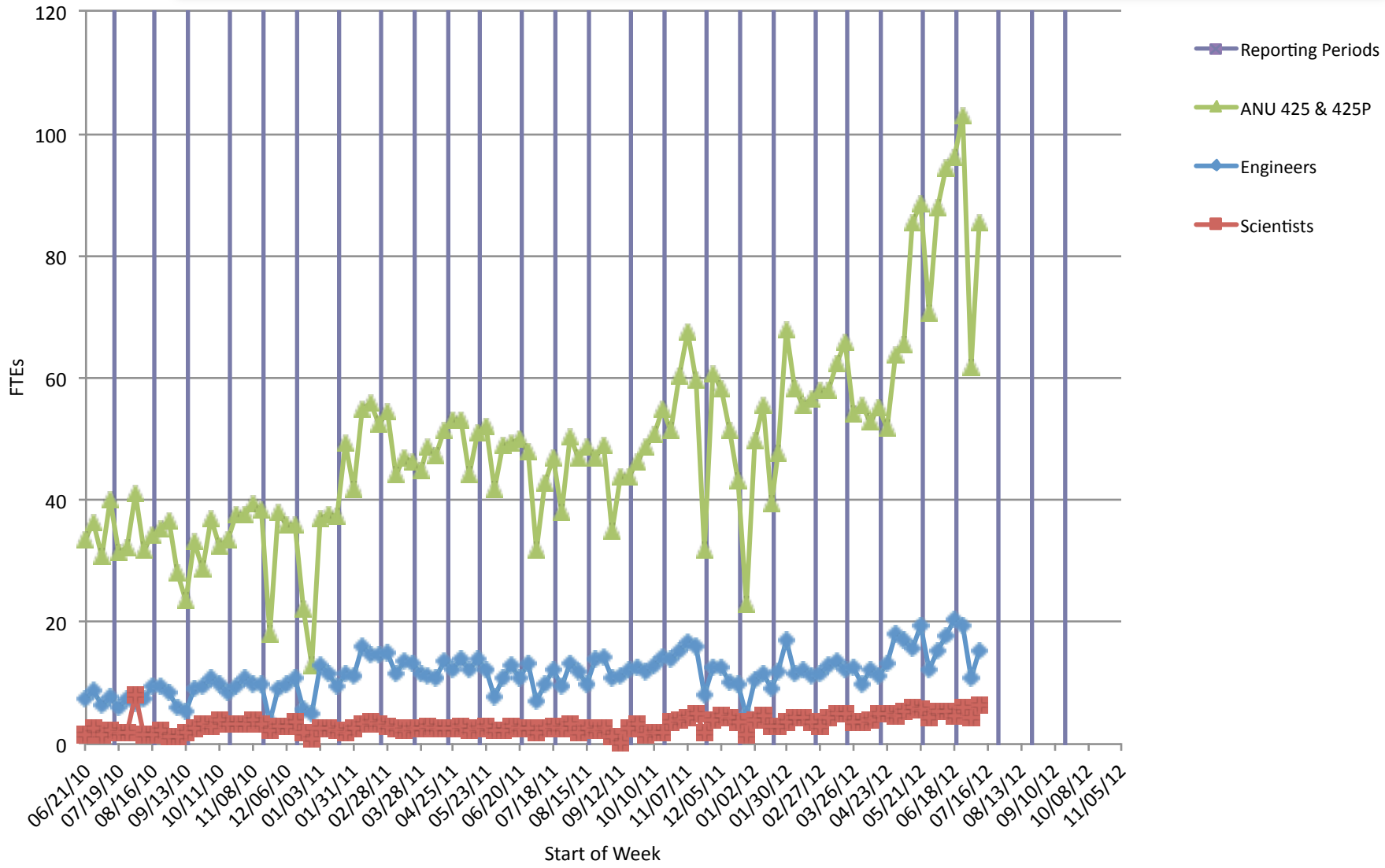


Summary

- Shutdown work progressing
  - Some ahead, some behind, anticipate meeting the schedule
- Costs still slipping, still paying attention
  - Corrections identified and being applied in July and August



FTE := 34 hours/week



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